

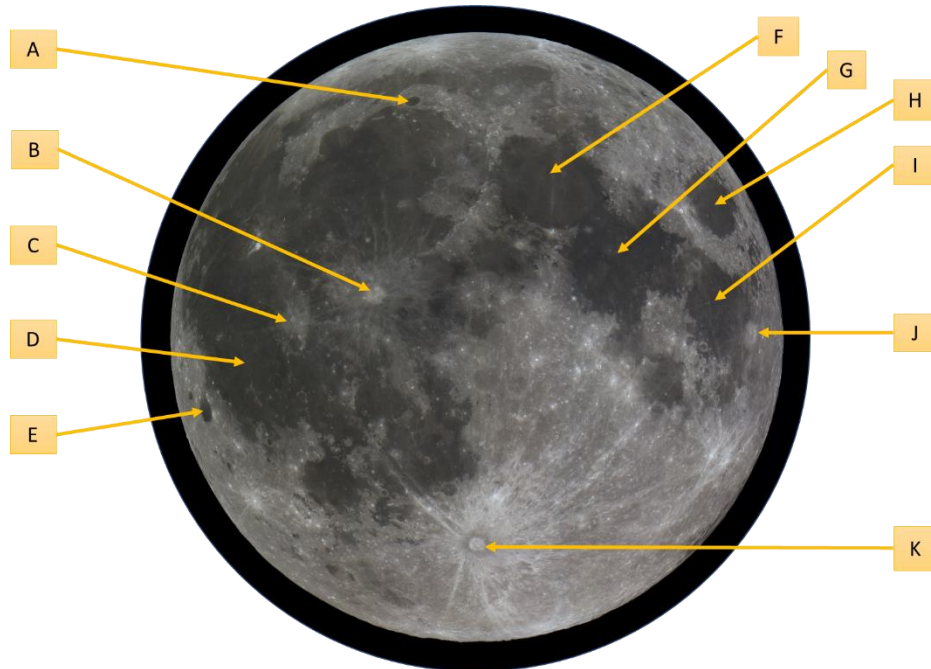
1 Division B – Solar System

1.1 Identify Features of Moon

1 Point each (MUST include both parts, 0.5 if only the 1st part is provided, 0.25 for only English names)

Points
Earned:

/11



#	Provide your answer below
A.	Plato Crater
B.	Copernicus Crater
C.	Kepler Crater
D.	Oceanus Procellarum (Ocean of storms)
E.	Grimaldi Crater
F.	Mare Serenitatis (Sea of Serenity)
G.	Mare Tranquillitatis (Sea of Tranquility)
H.	Mare Crisium (Sea of Crises)
I.	Mare Fecunditatis (Sea of fecundity / fertility)
J.	Langrenus Crater
K.	Tycho Crater

1.2 Answer These Questions about our Moon and Key Phenomena

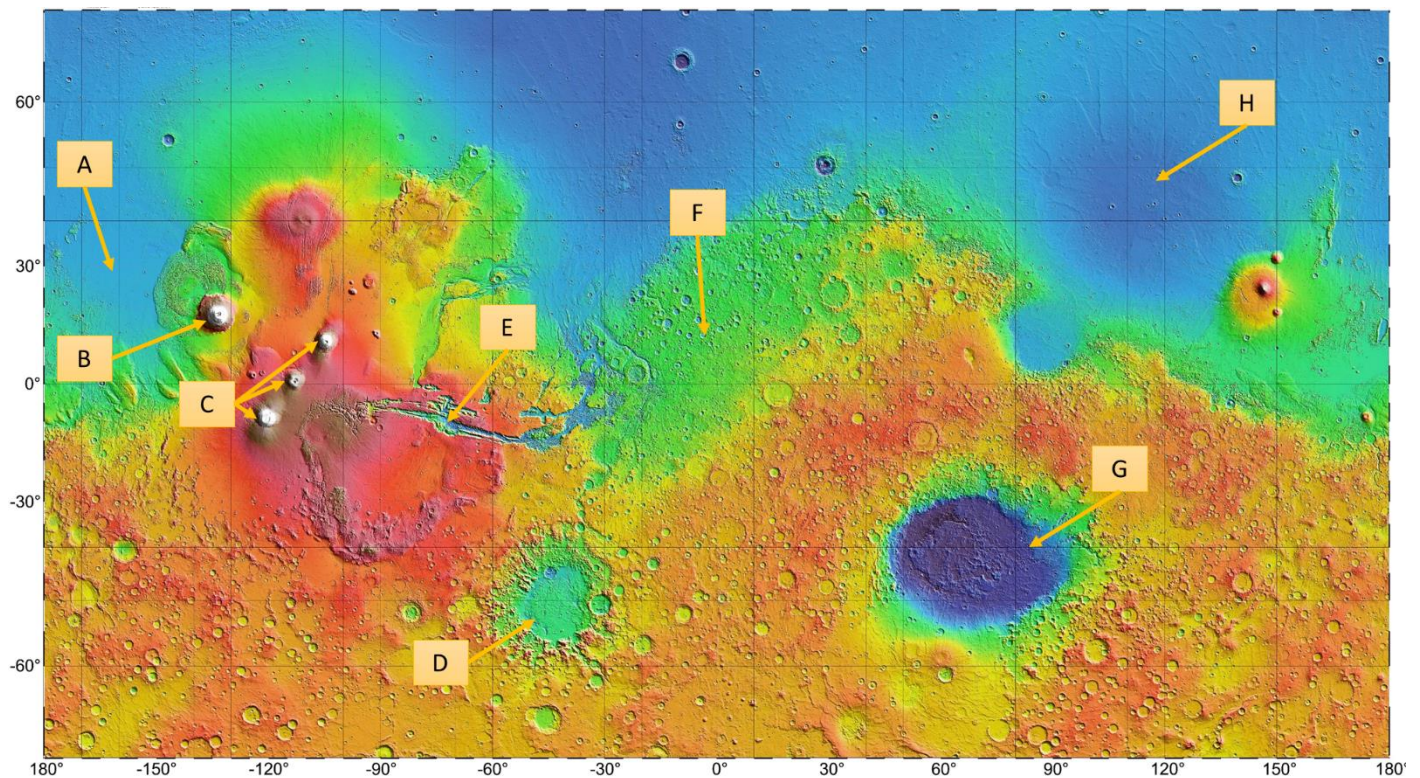
1 Point each for both the parts		Points Earned:	/13
#	Question	Answer	
A.	The Moon keeps the same side, or face, towards Earth during its orbit around the Earth. What is this phenomenon called?	Synchronous Orbit or Synchronous rotation or Tidal locked orbit or gravitational locking or captured rotation	
B.	Even though we see only one face of the moon, we can see more than 50% of the moon's surface from Earth. What two phenomena allow this?	Libration and Parallax	
C.	What is the phenomenon called when the ratio of rotation period of a body to its own orbital period is some simple fraction different from 1:1?	Rotation-orbit resonance	
D.	The phenomenon describing the amount by which an orbit of an astronomical object deviates from a perfect circle is known as?	orbital eccentricity	
E.	What shape will the orbit of an object take if the value for this phenomenon is more than 0 but less than 1?	Elliptical	
F.	What shape will the orbit (or trajectory) of an object take if the value for this phenomenon is 1?	Parabolic	
G.	What element makes up the Moon's inner core?	Iron	
H.	What state is that element in within the Moon's inner core (liquid, gas or solid)?	Solid	
I.	What percentage is the inner core diameter compared to the overall diameter of the moon?	20%	
J.	In celestial mechanics with two bodies, what name is given to positions or points where a third smaller body only affected by gravity can maintain its position relative to the two large bodies?	Lagrangian points Lagrange points L-points Libration points	
K.	For two body celestial mechanics, how many such points are possible?	5 (five)	
L.	What is the name for the lunar phase between half and full phases?	Gibbous	
M.	The most likely theory for the origin of the moon is a. the Earth used to be much larger but became unstable - the moon is a large amount of material that spun out of the early Earth b. the Moon formed from debris caused by a collision of the Earth and a very large planetary body. c. the Moon and Earth formed at the same time out of the same material d. the Moon formed far away and was captured by the Earth's gravitational field	b. the Moon formed from debris caused by a collision of the Earth and a very large planetary body.	

1.3 Mars - Identify Features

1 Point each for correct answer including both parts of the name

Points
Earned:

/8



#	Provide your answer below
A.	Amazonis Planitia
B.	Olympus Mons
C.	Tharsis Montes
D.	Argyre Planitia
E.	Valles Marineris
F.	Arabia Terra
G.	Hellas Planitia
H.	Utopia Planitia

1.4 Mars – Additional Questions

1 Point each for correct answer

**Points
Earned:**

/8

#	Question	Answer
A.	What kind of map of Mars is used in the previous question?	Topological map
B.	Which instrument was used to create that map?	Mars Orbiter Laser Altimeter or MOLA
C.	Which robotic spacecraft does this instrument belong to?	Mars Global Surveyor
D.	Which region is the lowest point on Mars is located?	Hellas Planitia
E.	What's the approximate difference between the highest and lowest points on Mars (in meters)?	30,000 meters
F.	Prior to 2001, what method was used to define the Zero elevation (also known as "datum") for mapping the surface of Mars?	Constant Atmospheric Temperature or 610.5 Pa (6.105 mbar) below which water can never be stable
G.	After 2001, what new convention was chosen to define the zero elevation ("datum") for Mars?	Equipotential surface whose average value at the equator is equal to the mean radius of the planet
H.	Name the geological feature used as the reference for prime meridian for Mars.	Airy-0 (zero) within Airy impact crater (either of these will give full points) within Meridiani Planum region (no points)

1.5 Missions to Solar Systems

1 Point each for correct answer		Points Earned:	/ 12
#	Question	Answer	
A.	Name the longest active mission to Mars	Mars Odyssey	
B.	In addition to the three primary instruments on this mission equipment, what support function does it provide to other robots to Mars?	Telecommunication (or communication) relay – One-word answer is OK too	
C.	Name the longest running rover on the Mars surface	Opportunity	
D.	Which robot is set out to answer the question: Did Mars ever have the right environmental conditions to support small life forms called microbes?	Curiosity	
E.	Which robot is sent out to Mars whose mission's scientific goals was to search for and characterize a wide range of rocks and soils for clues to past water activity on Mars?	Opportunity	
F.	Which spacecraft is tasked to study the atmosphere of Venus and is still operational as of Feb 2018?	Akatsuki (Japan)	
G.	Which spacecraft was successful in mapping the surface of Venus?	Magellan (USA)	
H.	Which spacecraft had a successful touchdown on the surface of Venus?	Venera 7 (Russia)	
I.	Which spacecraft became the first to get into orbit of Mercury?	MESSENGER	
J.	MESSENGER solved the decades-old question of whether there are volcanic deposits on the Mercury's surface. Are there?	Yes	
K.	Which spacecraft revealed that ions stripped from Io's surface create a torus (or doughnut) around Jupiter and inflate the planet's magnetic field; and Io acts like an electric generator in Jupiter's magnetic field, sending 5 million amperes of current along the magnetic field to Jupiter.	Voyager 1	
L.	Which spacecraft is NASA's longest-operating mission spacecraft?	Voyager 2	

1.6 Mars – Again!

1 Point each for correct answer		Points Earned:	/11
#	Question	Answer	
A.	How would you describe consistency of lava that formed Olympus Mons? A: Thick and Pasty or B: Thin and runny?	B: Thin and Runny	
B.	Which mineral, abundant in both terrestrial and Martian crust, determines the ferocity (from gentle to explosive) of an erupting volcano?	Silica or SiO ₂ (not silicone)	
C.	Which of the large Tharsis volcanoes does not actually reside on the Tharsis bulge itself?	Olympus Mons	
D.	Which of the following permitted Martian volcanoes to become so massive? a. The thick Martian crust c. The weaker gravity of Mars b. The absence of plate tectonics d. All of the above	d. All of the above	
E.	Why are there so few impact craters in the area within the Tharsis bulge and its immediate surroundings?	This large area was once inundated (covered) by recent lava flows. (volcanic resurfacing)	
F.	What large chain of terrestrial [Earth] volcanic islands formed from plumes of rising mantle material like the way in which the large Martian volcanoes were formed?	Hawaiian Islands	
G.	What kind of event created the large Hellas basin in southern Mars?	Large asteroid impact (also accept meteorite impact)	
H.	Uplifting of which plateau created Valles Marineris, the largest system of canyons in our solar system?	Tharsis	
I.	What is lacking on Mars to prevent major Martian quakes like earthquakes on Earth?	Plate tectonics or [1] continental drift (tectonic activity)	
J.	What atmospheric compound formed the frost visible in the images of the ice caps on Martian south poles?	Carbon Dioxide	
K.	What is the material that produces the distinct red color of Mars? a) rust, or iron oxides b) scattered sunlight from very fine dust, like sunset effects on the Earth c) red-colored vegetation that seems to fluctuate seasonally, particularly near the equator d) carbon dioxide because it absorbs blue and green light preferentially	a. Rust or iron oxides	

1.7 Remote Star System

1 Point each for correct answer

Points Earned:

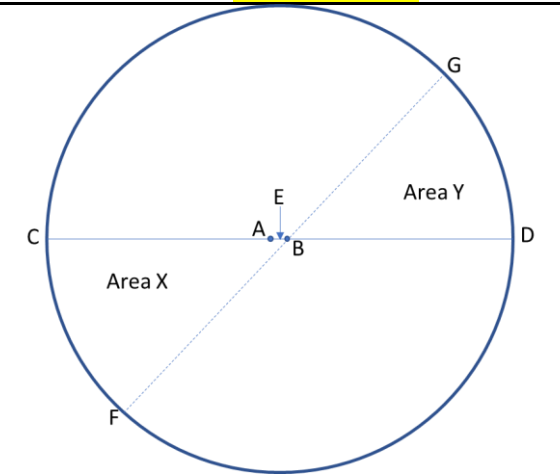
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Following table describes the planets around a star in a nearby star system. Answer questions based on the planet data table below.

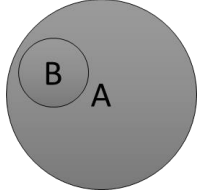
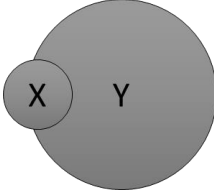
Planets	Composition	Atmospheric Pressure	Winds	Water	Int. Temp	Volcanoes	Tectonics
I	Rocky	1000 mb	Moderate	Lots	Hot	Active	Moderate
II	Icy	Tenuous	None	Ice	Hot	None	Active
III	Rocky	92,000 mb	Weak	None	Hot	Active	None
IV	Rocky	Tenuous	None	None	Cold	Extinct	None
V	Rocky	Tenuous	None	None	Hot	Numerous	None
VI	Rocky	6.8 to 9 mb	Mild	None	Warm	Extinct	None

#	Questions	Answer
A.	Which satellite would be considered geologically dead?	IV
B.	Which satellite's craters would be eroded during planet-wide dust storms?	VI
C.	Which satellite would be the best candidate for human colonization?	I
D.	Which satellite is the best candidate for harboring only simple forms of life?	II
E.	Which satellite would erase scars of an impact crater most quickly?	V
F.	Which satellite would be most inhospitable to human colonization?	III
	Match each of these satellites with its "twin" satellite within in our own solar system.	
G.	Mars	VI
H.	Io	V
I.	Mercury	IV
J.	Earth	I
K.	Venus	III

1.8 Fundamentals of Astronomy

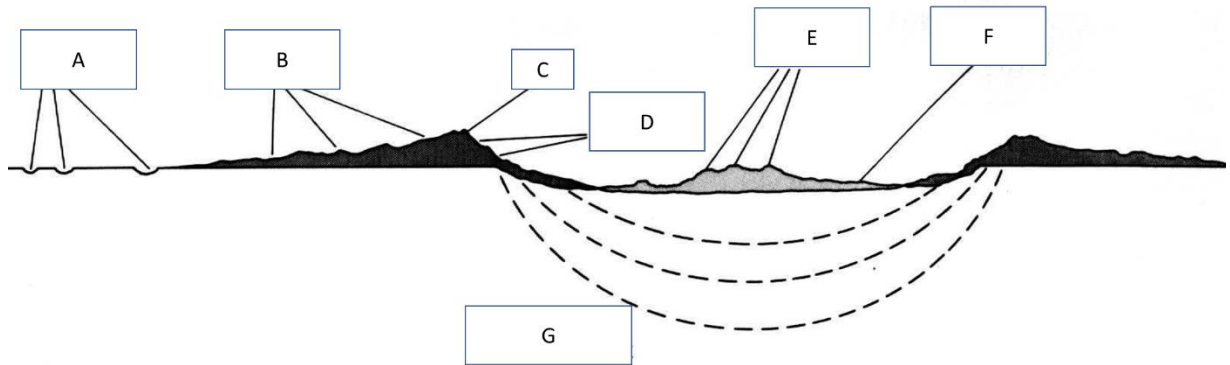
1 Point each for correct answer		Points Earned:	/11
#	Answer	Answer	
A.	Kepler's first law of planetary motion states that the orbit of a planet around the Sun is an A: <u>Ellipse</u> (name of shape) with the Sun at one B: <u>Focus</u> (part of that shape).	Fill in the blanks	
B.	Kepler's second law of planetary motion states that a line joining a planet and the Sun sweeps out equal C: <u>Area</u> in equal D: <u>Interval of Time</u> .	Fill in the blanks	
C.	Kepler's third law of planetary motion states that the squares of the E: <u>Sidereal</u> periods of the planets are proportional to the cubes of their F: <u>semimajor axes</u> .	Fill in the blanks	
	 <p>The diagram describes the orbit of Planet Mars around the Sun. Assume that the time required for Mars to cover the distance D to G is equal to the time required to cover the distance from C to F.</p>		
D.	Which of Kepler's three laws explains the repetitive and consistent changes in the orbital speed of a planet?	2 nd / Second	
E.	Assume that Mars is orbiting the Sun in a counterclockwise direction. Is Mars moving faster as it approaches point D or point C?	Point D	
F.	Is the Sun located at point A, B, or E?	B	
G.	Of the nine recognized planets in our solar system, Neptune's orbit is the least eccentric. Would the foci of Neptune's orbit be spaced closer together or farther apart as compared to those of the other planets?	Closer together	
I.	Does the letter C or D mark the location of Mars when at aphelion?	C	
J.	Line CD is the longer of two lines about which an ellipse is symmetrical. What term or phrase identifies this line?	Major axis	
K.	What term refers to the distance between points E and D (or C and E)?	Semimajor axis	

1.9 Formation of Rocky Bodies

1 Point each for correct answer		Points Earned:	/ 8
#	Question	Answer	
A.	Which of the following correctly lists the relative abundance of compounds with increasing distance from the Sun? i. Water ice, metal/rock, other ices ii. Metal/rock, other ices, water ice iii. Metal/rock, water ice, other ices iv. Other ices, metal/rock, water ices	iii	
B.	Which astronomical body is the most volcanically active world in the Solar System?	Io	
C.	What is the fundamental cause of this volcanic activity on this body?	Gravitational force of Jupiter AND two other moons Europa and Ganymede (half point if only Gravity of Jupiter is mentioned. If only Jupiter is mentioned then 1/4 th the point)	
D.	Which of the following are located in the Kuiper Belt? a. Haumea b. Eris c. Namaka d. a and b only e. All of the above f. None of the above	E – all of the above	
E.	What is the densest planet in the solar system?	Earth	
F.	The tail of a comet always points AWAY FROM or TOWARDS the Sun?	Away from	
G.	When does a meteoroid become a meteorite?	It needs to hit the earth	
H.	Which crater in the diagrams below is younger? <div> <div>I</div>  <div>II</div>  </div>	I. B II. X	

1.10 ASDF (Yes! That's it! ASDF)

1 Point each for correct answer		Points Earned:	/ 12
#	Question	Answer	
A.	What are the techniques to determine the age of and geological history of planets? i. Law of superposition of geological features ii. Stratigraphy iii. Crater number density iv. Radiometric dating (using Radioisotope aging analysis) v. All of the above	v	
B.	Recently, another team of researchers proposed an alternate timescale for Mars geological history. What did they base their observation and conclusions on?	Minerals or Mineral Alternation	
C.	Why don't we see too many craters on Earth, Venus and Mars?	Burns up in atmosphere And geological processes cover up craters	
D.	Why don't we see any craters on Jupiter and Saturn?	These are gas giants and don't really have surface	
E.	Why do we see too many craters on Mercury?	Mercury is closest to Sun and Sun attracts many objects. Mercury doesn't have atmosphere or activities.	
F.	What is the most abundant element in the gas giants?	Hydrogen	
G.	Between which two planets is the asteroid belt?	Mars and Jupiter	
H.	The point in which the Earth's orbit is closest to the sun is called the ?	Perihelion	
I.	Which two planets have no moons?	Mercury and Venus	
J.	What phenomenon is responsible for making Venus' surface very hot?	Greenhouse effect	
K.	The conditions on the surface of Venus are a) a high-pressure, high-temperature, carbon dioxide atmosphere. b) a low-pressure, low-temperature, carbon dioxide atmosphere. c) no atmosphere, hence very variable temperatures under direct sunlight. d) a dense atmosphere of methane, ammonia, and water at a low temperature.	a high-pressure, high-temperature, carbon dioxide atmosphere.	
L.	If a planet did not spin at all, you would expect that it would not have a) volcanoes b) a greenhouse effect c) craters d) a magnetic field	D – A magnetic field	

1.11 Identify Parts of an Impact Crater**1 Point each for correct answer****Points Earned:****/ 7**

#	Provide your answers below
A.	Secondary Craters
B.	Ejecta blanket
C.	Rim
D.	Terraces
E.	Central Peaks
F.	Floor (or Crater floor)
G.	Shocked and shattered crust